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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/763,672	01/24/2004	Fusao Ishii	Fishii004	9096
7590 12/14/2005				
Fusao Ishii 350 Sharon Park Drive, G26 Menlo Park, CA 94025				
EXAMINER TRA, TUYEN Q				
ART UNIT		PAPER NUMBER		
2873				

DATE MAILED: 12/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/763,672

Applicant(s)

ISHII ET AL.

Examiner

Tuyen Q. Tra

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 26 September 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claim 1, 14, 19 and 28 are rejected under 35 U.S.C. 102(e) as being anticipated by Aubuchon (U.S. Pat. 6,870,659 B2).

a) With respect to claim 1, Aubuchon discloses a micromirror structure in Fig. 9A' comprising of a reflecting element (item 126) that can be deflected into 2 states (OFF and ON states), and a support structure (item 212) for supporting the reflecting element (126), the support structure comprising at least 1 wall (214); wherein the support structure (212) is sufficient to support the reflecting element (126) and the support structure (212) is in direct contact with the reflecting element (126).

b) With respect to claim 14, Aubuchon discloses a mirror structure in Fig. 9A' comprising of a reflecting element (item 126) that can be deflected into 2 states (OFF and ON states), and a support structure (item 212) for supporting the reflecting element (126), the support structure comprising at least 1 wall (214); wherein the support structure (212) is sufficient to support the reflecting element (126) and the support structure (212) is in direct contact with the reflecting element (126); and a deformable element (126) that is connected to the support structure (212).

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c) With respect to claim 15-18, Aubuchon further discloses wherein the deformable element comprises a crystalline semiconductor material; wherein the crystalline semiconductor material is selected from the group consisting of polycrystalline silicon and monocrystalline silicon; wherein the crystalline semiconductor material is doped.

d) With respect to claim 19, Aubuchon discloses a mirror structure in Fig. 9A' comprising of a reflecting element that can be deflected into at least 2 states; a 1<sup>st</sup> support structure other than a post for supporting said reflecting element, said support structure comprising at least 1 wall; wherein the 1<sup>st</sup> support structure is sufficient to support the reflecting element and the 1<sup>st</sup> support structure is in direction contact with the reflecting element; a torsion hinge that is connected to said 1<sup>st</sup> support structure; and a 2<sup>nd</sup> set of support structures (item 144) for supporting said torsion hinge, said 2<sup>nd</sup> set of support structures defining an axis of rotation of the torsion hinge (hinge portions 130).

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 28-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aubuchon (U.S. Pat. 6,870,659 B2).

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a) With respect to claim 28, Aubuchon discloses a mirror structure in Fig. 9A' a reflecting element (item 126) that can be deflected into at least 2 states; a 1<sup>st</sup> support structure (item 212) other than post for supporting said reflecting element, said support structure comprising at least 1 wall (item 214), wherein the 1<sup>st</sup> support structure is sufficient to support the reflecting element and 1<sup>st</sup> support structure (212) is in direct contact with the reflecting element (126); and a base layer for supporting said 2<sup>nd</sup> set of support structures, the base layer having a 1<sup>st</sup> surface and a 2<sup>nd</sup> surface, with said 1<sup>st</sup> surface facing said reflecting element. However, Aubuchon does not disclose a deformable element that is connected to said 1<sup>st</sup> support structure; a 2<sup>nd</sup> set of support structures for supporting said deformable element. Within the same field of endeavor, Fleming teaches 1<sup>st</sup> supporter (32), a deformable layer (24, Fig. 4a), a 2<sup>nd</sup> supporter (40, Fig. 4a).

It would have been obvious, therefore, at the time the invention was made to a person having skill in the art to construct optical device with a first supporter, reflecting mirror, such as disclosed by Aubuchon, and with a deformable element that is connected to said 1<sup>st</sup> support structure; a 2<sup>nd</sup> set of support structures for supporting the deformable element such as discloses by Fleming, for purpose of supporting the mirror.

b) With respect to claims 29-35, Aubuchon further discloses wherein the base layer comprises a crystalline semiconductor material; wherein the crystalline semiconductor material is selected from the group consisting of polycrystalline silicon and monocrystalline silicon; wherein the base layer additionally comprises addressing electrodes for actuating the reflecting element; wherein the base layer additionally

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comprises addressing electrodes for actuating the deformable element; wherein the base layer additionally comprises control circuitry; wherein the control circuitry is disposed on the 1<sup>st</sup> surface of the base layer.

c) With respect to claim 36, Auchchon further discloses wherein the control circuitry is selected from the group consisting of: CMOS circuits, NMOS circuits, PMOS circuits, bipolar transistor circuits, BiCMOS circuits, DMOS circuits, HEMT circuits, amorphous silicon thin film transistor circuits, polysilicon thin film transistor circuits, SiGe transistor circuits, Sic transistor circuits, GaN transistor circuits, GaAs transistor circuits, InP transistor circuits, Cdse transistor circuits, organic transistor circuits, and conjugated polymer transistor circuits.

5. Claims 2, 5-10 and 20-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aubuchon (U.S. Pat. 6,870,659 B2) in view of Patel et al. (U.S. Pat. 6,885,494 B2).

a) With respect to claims 2 and 5-10, Aubuchon discloses a micromirror structure in Fig. 9A' comprising of a reflecting element (item 126) that can be deflected into 2 states (OFF and ON states), and a support structure (item 212) for supporting the reflecting element (126), the support structure comprising at least 1 wall (214); wherein the support structure (212) is sufficient to support the reflecting element (126) and the support structure (212) is in direct contact with the reflecting element (126).

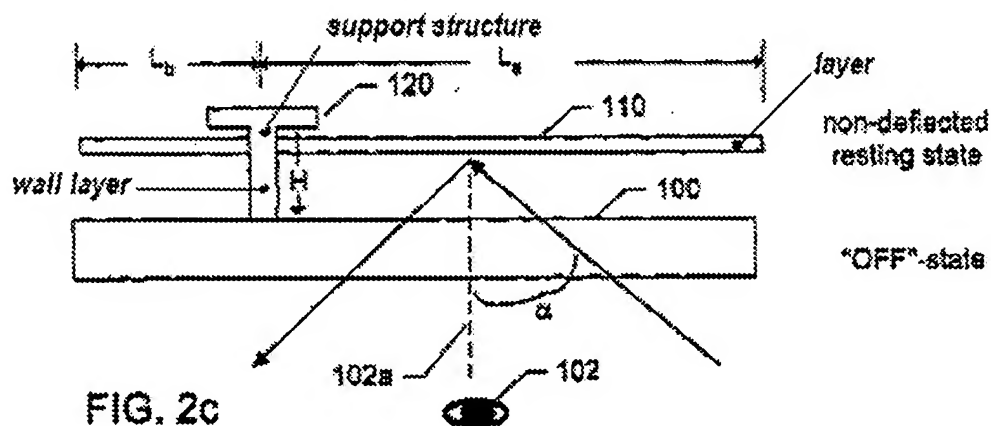
However, Aubuchon does not disclose wherein the reflecting element comprises metallic layer; wherein said reflecting element comprises 1 semiconductor layer; wherein said reflecting element comprises a plurality of dielectric layers; wherein the

reflective surface of said reflecting element is substantially planar with neither depressions nor protrusions; wherein the reflective surface of said reflecting element has no outer edges that are perpendicular to the projection of the incident light propagation vector onto the plane of said reflective surface; wherein the wall is oriented such that the angle between the projection of the incident light propagation vector onto the plane of the reflective surface of said reflecting element and a wall segment of the 1 wall is between  $0^{\circ}$  and  $45^{\circ}$  degree; wherein the wall is contained in a layer that is separate from the layer that contains the reflecting element. Within the same field of endeavor, Patel discloses a high angle micromirror and processes in Figure 2C comprising of a reflecting element (item 110) that can be deflected into at least 2 states (OFF and ON states), and a support structure (not numbered) for supporting the reflecting element (110), the support structure comprising at least 1 wall (see Fig. below); wherein the reflecting element comprises at least 1 metallic layer (for electrostatic attraction); wherein the reflective surface of the reflecting element (110) is substantially planar with neither depressions nor protrusions, wherein the reflective surface of the reflecting element has no outer edges that are perpendicular to the projection of the incident light propagation vector onto the plane of the reflective surface (110).

It would have been obvious, therefore, at the time the invention was made to a person having skill in the art to construct optical device with micro-mirrors (48) such as disclosed by Aubuchon, and with wherein the reflecting element comprises metallic layer; wherein said reflecting element comprises 1 semiconductor layer; wherein said

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reflecting element comprises a plurality of dielectric layers; wherein the reflective surface of said reflecting element is substantially planar with neither depressions nor protrusions; wherein the reflective surface of said reflecting element has no outer edges that are perpendicular to the projection of the incident light propagation vector onto the plane of said reflective surface; wherein the wall is oriented such that the angle between the projection of the incident light propagation vector onto the plane of the reflective surface of said reflecting element and a wall segment of the 1 wall is between  $0^\circ$  and  $45^\circ$  degree; wherein the wall is contained in a layer that is separate from the layer that contains the reflecting element such as discloses by Patel et al.('897), for purpose of supporting and deflecting the mirror.



- b) With respect to claims 20-27, Aubuchon discloses a reflecting element (item 126) that can be deflected into 2 states (OFF and ON states), and a support structure (item 212) for supporting the reflecting element (126), the support structure comprising at least 1 wall (214); wherein the support structure (212) is sufficient to support the

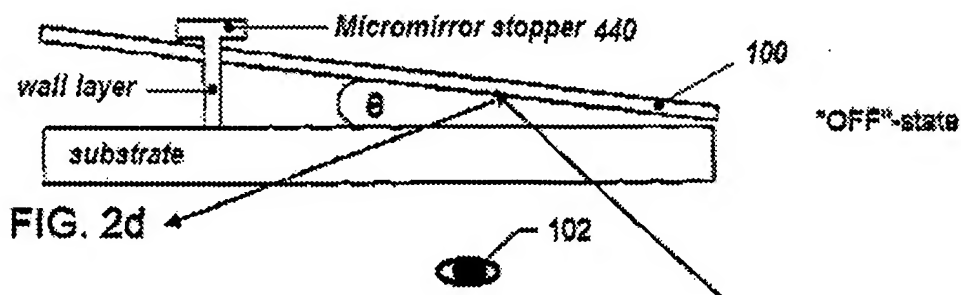


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reflecting element (126) and the support structure (212) is in direct contact with the reflecting element (126).

However, Aubuchon does not disclose wherein each of the 2<sup>nd</sup> set of support structures comprises at least 1 portion for limiting the deflection of said reflecting element wherein said 2<sup>nd</sup> set of support structures comprises support structures selected from the group consisting of: triangular structures, polygonal structures, walls, elliptical structures, and circular structures, wherein said 2<sup>nd</sup> set of support structures comprises a material selected from the group consisting of: polycrystalline silicon, monocrystalline silicon, amorphous silicon, Al, Al alloy, Mo, W, TiSi<sub>2</sub>, WSi<sub>2</sub>, CoSi<sub>2</sub>, Ti:W, TiN, and Cu, wherein said polycrystalline silicon is doped, wherein said monocrystalline silicon is doped, wherein said torsion hinge comprises a crystalline semiconductor material, wherein said crystalline semiconductor material is selected from the group consisting of polycrystalline silicon and monocrystalline silicon, wherein said crystalline semiconductor material is doped. Within the same field of endeavor, Patel et al. further discloses wherein each of the 2<sup>nd</sup> set of support structures comprises at least 1 portion (mirror stopper) for limiting the deflection of the reflecting element; wherein the 2<sup>nd</sup> set of support structures comprises support structures selected from the group consisting of: triangular structures, polygonal structures, walls, elliptical structures, and circular structures; wherein the 2<sup>nd</sup> set of support structures comprises a material selected from the group consisting of: polycrystalline silicon, monocrystalline silicon, amorphous silicon, Al, Al alloy, Mo, W, TiSi<sub>2</sub>, W Si<sub>2</sub>, Co Si<sub>2</sub>, Ti:W, TiN, and Cu.

It would have been obvious, therefore, at the time the invention was made to a person having skill in the art to construct optical device with a wall such as disclosed by Aubuchon, and with 2nd set of support structures comprises at least 1 portion for limiting the deflection of said reflecting element wherein said 2nd set of support structures comprises support structures selected from the group consisting of: triangular structures, polygonal structures, walls, elliptical structures, and circular structures, wherein said 2nd set of support structures comprises a material selected from the group consisting of: polycrystalline silicon, monocrystalline silicon, amorphous silicon, Al, Al alloy, Mo, W, TiSi.sub.2, WSi.sub.2, CoSi.sub.2, Ti:W, TiN, and CuI, wherein said polycrystalline silicon is doped, wherein said monocrystalline silicon is doped, wherein said torsion hinge comprises a crystalline semiconductor material, wherein said crystalline semiconductor material is selected from the group consisting of polycrystalline silicon and monocrystalline silicon, wherein said crystalline semiconductor material is doped such as discloses by Patel et al., for purpose of supporting the mirror.



- c) With respect to claims 7-10, Patel et al. further discloses wherein the at least 1 wall is oriented such that the angle between the projection of the incident light propagation vector onto the plane of the reflective surface of the reflecting element and

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a wall segment of the at least 1 wall is between  $0^{\circ}$  and  $75^{\circ}$ ; wherein the angle is between  $0^{\circ}$  and  $60^{\circ}$ ; wherein the angle is between  $0^{\circ}$  and  $45^{\circ}$  (col. 6, lines 8-12); wherein the at least 1 wall is contained in a layer that is separate from the layer that contains the reflecting element.

6. Claims 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aubuchon (U.S. Pat. 6,870,659 B2), as applied to claim 1 above, in view of Min (US Patent 5,886,811 A).

Aubuchon discloses a high angle micromirror and processes in Figure 2C comprising of a reflecting element (item 110) that can be deflected into at least 2 states (OFF and ON states), and a support structure (not numbered) for supporting the reflecting element (110), the support structure comprising at least 1 wall. However, Aubuchon does not disclose wherein the support structure comprising at least 1 wall comprises a material selected from the group consisting of: polycrystalline silicon, mono-crystalline silicon, amorphous silicon, Al, Al alloy, Mo, W,  $\text{TiSi}_2$ ,  $\text{WSi}_2$ ,  $\text{CoSi}_2$ , Ti:W, TiN, and Cu. Within the same field of endeavor, Min discloses a thin film actuated micro-mirror array in an optical projection system and method for manufacturing the same with teaching of the wall (post) made for elastic material such as an aluminum alloy (col. 9, lines 49-59).

It would have been obvious, therefore, at the time the invention was made to a person having skill in the art to construct optical device with a post (wall) such as disclosed by Aubuchon, and with the wall made of Aluminum alloy material such as disclosed by Min, for purpose of supporting the mirror.

7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Aubuchon (U.S. Pat. 6,870,659 B2), as applied to claim 1 above, in view of Patel et al. (U.S. Patent 6,867,897 B1).

Aubuchon discloses a high angle micro-mirror and processes in Figure 2C comprising of a reflecting element (item 110) that can be deflected into at least 2 states (OFF and ON states), and a support structure (not numbered) for supporting the reflecting element (110), the support structure comprising at least 1 wall. However, Aubuchon does not disclose a semiconductor layer of mirror. Within the same field of endeavor, Patel et al. 897' discloses a micromirror and off-diagonal hinge structures for micromirror arrays in projection displays comprising of micro-mirror array with teaching a semiconductor (silicon dioxide) layer (col.1, lines 53-54).

It would have been obvious, therefore, at the time the invention was made to a person having skill in the art to construct optical device with micro-mirrors (48) such as disclosed by Aubuchon, and with the a semiconductor (silicon dioxide) layers in mirrors such as discloses by Patel et al.('897), for purpose of insulating the mirror.

8. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Aubuchon (U.S. Pat. 6,870,659 B2), as applied to claim 1 above, in view of Huibers (U.S. Patent 6,356,378 B1).

Aubuchon discloses a high angle micro-mirror and processes in Figure 2C comprising of a reflecting element (item 110) that can be deflected into at least 2 states (OFF and ON states), and a support structure (not numbered) for supporting the reflecting element (110), the support structure comprising at least 1 wall. However,

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Aubuchon does not disclose a plurality of dielectric layers. Within the same field of endeavor, Huibers discloses a double substrate reflective spatial light modulator comprising of micro-mirror array with teaching a plurality of dielectric mirror layers (items 70,72, Fig. 2F).

It would have been obvious, therefore, at the time the invention was made to a person having skill in the art to construct optical device with micro-mirrors (48) such as disclosed by Aubuchon, and with the a plurality of dielectric layers in mirrors such as discloses by Huibers, for purpose of insulating the mirror.

### ***Response to Arguments***

9. Applicant's arguments with respect to claims 1-36 have been considered but are moot in view of the new grounds of rejection.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

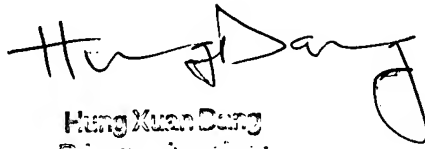
***Conclusion***

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tuyen Tra whose telephone number is (571) 272-2343. The examiner can normally be reached on Monday to Thursday from 8:30am to 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricky L Mark, can be reached on (571) 272 - 2333. The fax number for this Group is (703) 872-9306.

TT

December 3, 2005

  
Hung Xuan Dang  
Pat. Ex. Examiner